

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements relating to Axial-Flow Compressors

We, GENERAL MOTORS CORPORATION, a Company incorporated under the laws of the State of Delaware in the United States of America, of Grand Boulevard in the City of Detroit, State of Michigan, in the United States of America (Assignees of VIRGIL K. EDER) do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in axial-flow compressors.

The scope of the invention is defined by the appended claims and how it may be performed is hereinafter particularly described with reference to the accompanying drawing, in which:—

Figure 1 is a fragmentary view, partially in section, of a multistage axial-flow air compressor;

Figure 2 is a fragmentary view, partially in section, of one stage of an air compressor taken on line 2—2 of Figure 1.

Referring now to the drawing, an axial-flow compressor indicated generally at 1, is shown in a housing 3, only so much of the compressor being shown as is necessary to illustrate the invention. The rotor carries rows of rotor blades 5. Extending inwardly from the housing 3 between the rows of rotor blades 5 are the rows of stator vanes 7, which are supported by rings 9 secured in annular grooves 11 in the housing 3.

The portions 15 of the housing adjacent the paths described by the tips 13 of the moving blades 5 have a wear resistant coating 17 comprising a mixture of a high-temperature resistant, thermosetting resinous material which is both tough and resistant to sea water and hot engine oils, together with a hard abrasive grit. It has been found that coating 17 will protect the housing from corrosion while being tightly adherent thereto and capable of resisting abrasion during operation and cleaning of the com-

pressor. As indicated in the fragmentary end view in Figure 2, the coating 17 extends around the entire circumferential portion of the housing adjacent the moving rotor blade tips. More complete protection of the housing may be achieved by coating stator ring grooves 11 with a high temperature resistant resin such as a silicone resin. This not only protects the groove surface from corrosion but also prevents bypass of air through the grooves. The resinous material should preferably be capable of withstanding temperatures as high as about 600°F. and the coating must withstand the abrasive action of walnut shell grits of about 10—20 mesh size used in a high pressure fluid stream for cleaning the walls of the compressor. While any resinous material having the required characteristics above identified may be used, epoxy or silicone resins are preferred. While any hard abrasive grit such as aluminium oxide, boron carbide or silicon carbide may be used, it is preferred to use silicon carbide of about 500 mesh size. The coating must be adherent to the base metal of the housing and possess a uniform surface free from blisters, chips or other objectionable defects. Coatings having the desired characteristics may be obtained by the methods hereinafter described when using a coating mixture consisting of between 20 and 35% by weight hard abrasive grit and between 65 and 80% by weight resinous material. A mixture of about 25% silicon carbide in about 75% epoxy resin is preferred. The fluidity of the mixture may be controlled to achieve the desired handling characteristics by the addition of more or less solvent thinner.

The surface to be coated should be properly cleaned, prior to application of the coating mixture 17, to remove grit, dirt, oils and oxide film. The cleaning may be effected by grit blasting using a suspension of about one part by weight abrasive, such as about 325 mesh silica flour, in about 3 to 4 parts by weight water. The cleaning suspension is projected

against the surface to be coated using air pressure of about 60 to 90 lbs. p.s.i. gauge. The surface is subjected to cleaning in this manner for a length of time sufficient to produce a uniform, dull, matt finish. After removal of all grit, the surface may be chemically treated to increase corrosion resistance.

5 The coating mixture is then applied to the surface to be treated, by spraying, brushing or
10 roll coating, spraying being preferred. During spraying it is necessary to agitate the mixture to prevent settling of the grit. The coating should be applied in at least two coats to achieve a coat thickness not exceeding about
15 0.003 inches, or a total thickness (both coats) of 0.006 inches. Each coat should be dried at room temperature for about one hour followed by baking at a temperature of about
20 150°F. for about one hour. A final bake at the approximate temperatures encountered during operating conditions, about 450 to 500°F., for about two hours is then applied, the part being then removed from the oven and cooled to room temperature.

25 WHAT WE CLAIM IS:—

1. An axial-flow compressor comprising a rotor having rows of blades thereon, a housing surrounding said rotor and adjacent the tips of said blades, and a coating on the housing comprising a mixture of hard abrasive grit in a thermosetting synthetic resinous material, the coating being resistant to wear by abrasive cleaning while also protecting the metal from corrosion.

35 2. A compressor as set forth in claim 1, wherein the hard abrasive grit is silicone carbide, aluminium oxide or boron carbide.

3. A compressor according to claim 2, wherein said resinous material is epoxy or silicone resin.

4. A method for forming a wear, and corrosion-resistant coating on a metal part of an axial-flow compressor housing, comprising the steps of preparing a coating mixture consisting of from between 20 and 35% by weight of hard abrasive grit and from between 65 and 80% by weight of heat resistant resinous material, preparing the surface to be coated by grit blasting to produce a uniform dull matt finish, applying the coating mixture in at least two coats, while agitating the mixture, drying each coat at room temperature followed by baking, and subjecting the coated surface to a final bake at a temperature within actual compressor operating temperatures, removing the coated part from the baking chamber and cooling to room temperature.

5. A method as set forth in claim 4 wherein each coat is dried at room temperature for about one hour and followed by baking at about 150°F. for about one hour, the final bake of the coated part being at 450 to 500°F. for about two hours.

6. A method as set forth in claim 5 wherein said coating mixture consists of 25% by weight silicon carbide and 75% by weight epoxy resin.

7. An axial-flow compressor substantially as hereinbefore particularly described with reference to the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

